Heat of Fusion of Water

Introduction: Pure substances have characteristic melting and freezing temperatures. Pure water is a compound that will change from a solid at 00C to a liquid as energy is added to it. In this experiment you will determine the energy required to melt one gram of ice. The ice will be placed in a Styrofoam cup with water. What will happen to the ice in the water? How will energy flow through this system? What energy will be used to melt the ice?

Useful Info:

Joules: Unit of energy.

Cp of HOH=4.184J=1Cal= amt of E needed to raise 1g HOH 1oC

Materials:

Styrofoam cup

Bunsen Burner, Ring Stand, Ring, Wire Gauze Pad, Beaker

Stirring Rod

Tongs

Temperature

**Procedure:**

1. Warm approx. 125mL of water to approximately 50C

2. Measure 100 mL of this warm water into the Styrofoam cup

3. Measure & record the temperature of this warm water again, just before

4. Place several ice cubes in the warm water. (Dry them off before you put them in the cup)

5. Stir the water until the temperature is below 5C. Do you use your thermometer; get a stirring rod!!! This should take approx.. 50 sec.

6. Record the lowest temperature reached. Remove any remaining ice quickly.

7. Measure the new volume of water in the Styrofoam cup carefully to the nearest mL.

**Data&Calculations**:

1. Make a data table that looks like this:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Volume HOHi (mL) | Vol. HOHf  (mL) | Volume Change (mL)/Mass of Ice Melted | Temp. HOHi  OC | Temp. HOHf  OC | Temp. Change OC | Energy Lost by Warm Water | Energy  Gained by ice | Exp. Heat of Fusion | Percent  Error |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

2. Use the heat equation (Q=mCpT) to determine the amount of heat lost by the warm water.

3. Not all the energy lost by the warm water was used to melt ice. After the ice melted, what was its final temperature? What do you think happened to the energy that was not used to melt the ice? How much energy was gained by the ice after it melted? Use (Q=mCpT) to determine this. Be careful here, what’s the temperature change for the ice? What was the mass of the melted ice?

4. How much energy was needed to melt this ice? To find this out you’ll need another equation, here it is?

Energy lost by the warm water(#2 above) – Energy gained when ice warmed (#3 above) = Energy Needed to melt the ice.

5. Now you’re ready to calculate the amt. of energy needed to melt one gram of ice. This value is called the “heat of fusion” and is another one of our “Properties of Matter”. Can you figure out how to do this without your teacher?

6. The “Book Value” of the heat of fusion of ice is: 79.71 Cal/g or 333.51J/g

7. Calculate your percent error.

**Analysis & Conclusion**

1. Draw a melting point and boiling point graph for water.

2. Describe the differences between the ice and water and the phrase “melting point” in terms of kinetic molecular theory.

3. Do all solids have melting points? Can you think of some that do not?

4. How does water’s heat of fusion and specific heat capacity compare to other substances? Why is this so?

5.How does this unique characteristic of water influence our climate and living things in general?

6. Was your experimental answer exactly the same as the theoretical one? What do you think could cause differences between experimental and theoretical answers?

(Human error is not an answer here. )

Lab Write Up:

Title, Objective, Data Table, calculations, answers to all questions

Conclusion: What did this lab show about melting point, energy/heat transfer, efficiency, and the properties of water.